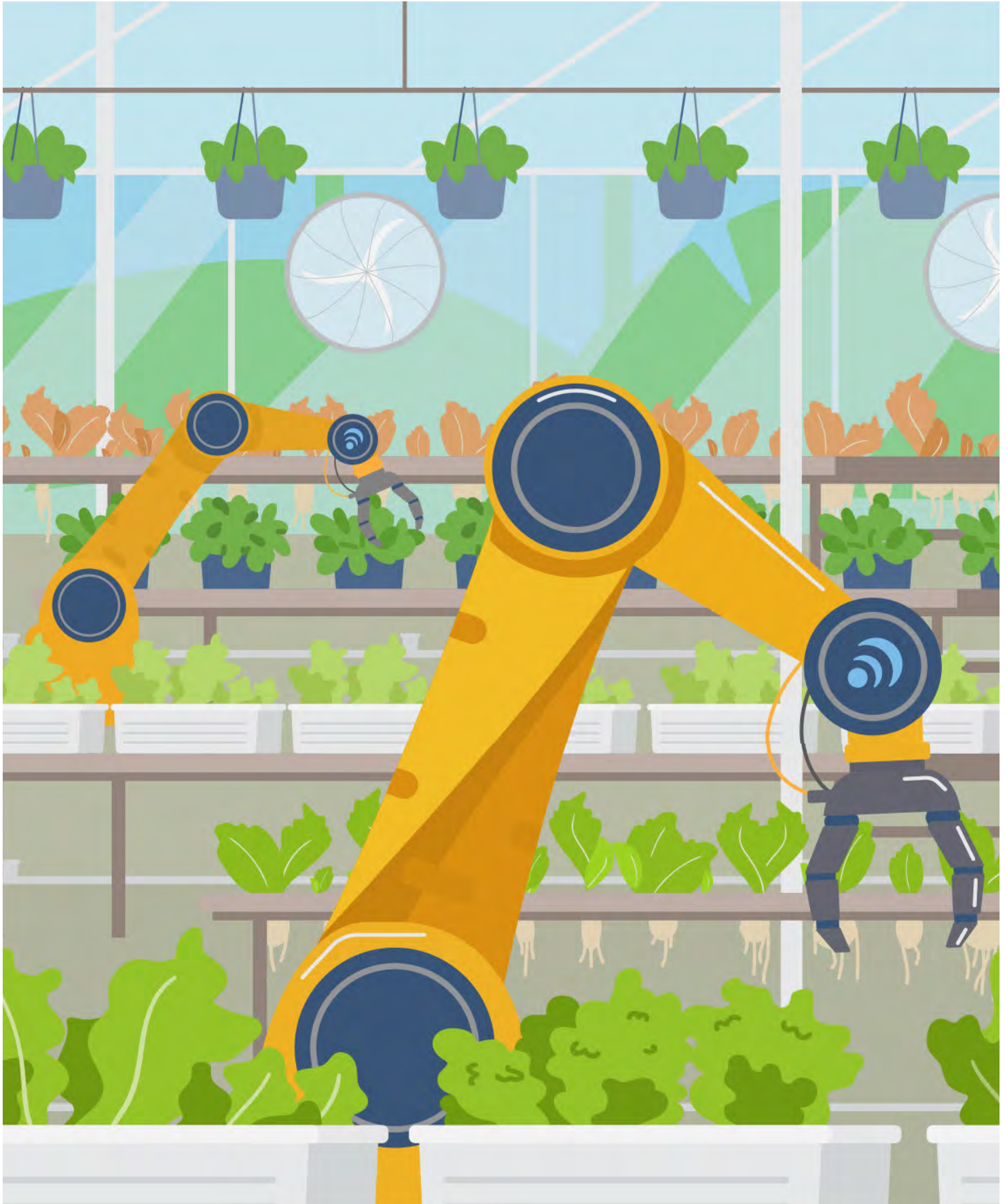


# Controlled Environment Horticulture



**3 billion**

cubic metres of natural gas used by Dutch glasshouses each year

**18%**

decrease in imports of European salad vegetables between 2020 and 2021

**838,000**

tonnes of salad vegetables imported into the UK in 2022

# Going Dutch: controlled environment horticulture in the UK

Can the UK emulate the role played by the Netherlands in global food production?

Less than 100 miles of water separates the United Kingdom and the Netherlands yet the differences in food production are stark and perplexing. The Netherlands has only around 16,000 square miles of land but is the second largest exporter of food in the world. While the Netherlands also has a robust re-export industry, the vast majority of all goods exported by the agriculture and food sector are Dutch-manufactured.

Less than half of the food consumed by Britons is produced in the UK, despite a land area more than six times as great as the Netherlands. In fact, of the 838,000 tonnes of salad vegetables imported into the

UK in 2022, 36% came from the Netherlands. Part of this will be attributable to the Rotterdam effect, whereby non-EU exports to the UK through the EU are recorded as originating in the first port of entry rather than their true nation of origin. The effect is named after the port of Rotterdam, one of the busiest in the world.

A further 32% came from Spain and 17% from Morocco. That's a staggering 85% originating from only three nations, a vulnerability that has been revealed recently as supermarkets begin to ration salad vegetables. This is due to Spanish farms suffering cold spells, while Morocco has

experienced flooding and plunging temperatures, which means that supermarkets are struggling to source produce.

UK policy is making increasingly favourable overtures to the controlled environment horticulture systems that have played such a central role in pushing the Netherlands to the forefront of global food production. In this Spotlight we investigate why and how the UK might develop this sector and where the opportunities lie for investors. We also look at whether there are alternative models of promoting horticulture with a greater range of benefits to consumers.



## WHAT IS CONTROLLED ENVIRONMENT HORTICULTURE?

Controlled environment horticulture uses various degrees of technology and protection to grow all manner of crops. Glasshouses and vertical farming use technology to control temperature, light, carbon dioxide levels and other factors essential for crop growth in order to optimise productivity. With this technology, yields are greatly enhanced, growing seasons are extended and output becomes more predictable.

## The impact of Brexit

2021 marked a sharp increase in the proportion of salad vegetables (tomatoes, lettuce, cucumbers and peppers) that the UK imported from outside Europe and a decrease in the proportion imported from EU member states (figure 1).

As time advances and this favouring of non-EU imports grows, evidence builds that the trend is more attributable to Brexit than Covid-19. While 2020 marked a jump, the proportion of non-EU imports had been growing since 2016. This was

the year that Brexit became a near-certainty and so it is reasonable to suggest growers, suppliers and retailers were already establishing alternative supply chains. Further checks will be applied to EU food and plant imports in June 2023, likely causing longer queues at borders and increasing friction and delays for perishable products.

Dutch growers have also been suffering from high energy costs to heat glasshouses. The high-tech nature of Dutch horticulture has not extended to a reliance

on renewable energy. Instead, Dutch glasshouses use around three billion cubic metres of gas a year, or about 8% of the national total. In the first half of 2022, this plummeted in an attempt to limit the impact of the energy price crisis, reducing output. While trade between the Netherlands and UK naturally fluctuates, volume declined by 10% between 2020 and 2021. There was some recovery in 2022, but volume remained lower than pre-2020 levels. This dynamic may prove favourable to British growers who have flexible cropping and new technology. The current supply crisis, with fruit and vegetable rationing in some supermarkets, may be the trigger that retailer supply chains need to reform procurement practice.

With security of contract, growers will be able to access greater economies of scale and potentially insulate themselves against economic headwinds. UK growers should not expect consolidation to be free of European competition, however. In order to secure share in a lucrative UK market, Dutch enterprises are also looking to secure growing space on this side of the Channel. A weakened, post-Brexit Sterling will make this more accessible.

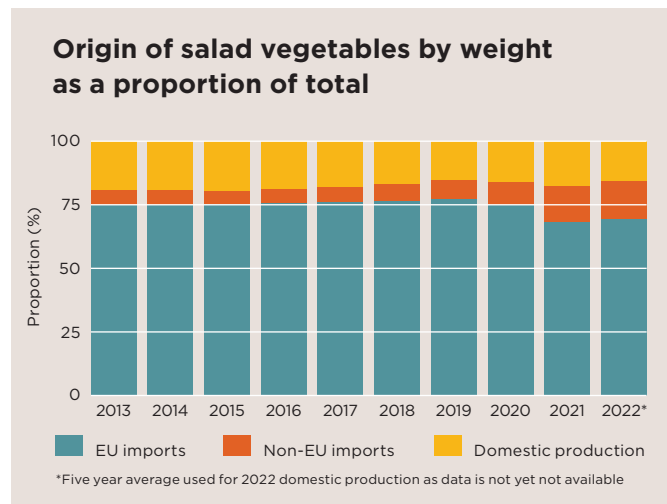


figure 1

Source HMRC, Defra, Savills Research

“ Controlled environment horticulture systems are a way of at least partially insulating against climate change and its impacts, such as those experienced by Spain and Morocco ”



## Why horticulture? Why now?

Aside from Brexit, there are multiple drivers pushing decision-making towards more efficient, technological methods of food production in the UK, such as that offered by controlled environment horticulture.

### POLICY

Globalisation is in retreat and reliance on imports and international supply chains is increasingly seen as a vulnerability. The Food Strategy White Paper released in June 2022 promised a subsequent horticulture strategy for England that included a focus on delivering glasshouses. The government does not envisage any significant leaps in output from conventional agriculture, meaning the burden of achieving a resilient food supply will, at least partially, fall upon the shoulders of high-tech horticulture. The forthcoming general election is likely to feature food security as a campaign point, with the Labour Party adopting a “grown, made and bought in Britain” mantra and promising that half of public procurement catering spend will be on locally grown produce. Such a pledge is likely to require an increase in the planted area under protection (see *figure 2*, page 4).

### LABOUR

The food strategy states the “skilled worker visa route will allow skilled professionals from overseas to bring their expertise to the UK in developing this sector”. This marks at least a partial departure from the controversies of the seasonal worker visa, arguably seeking to reduce the need for seasonal labour given the

focus on automation and the alternative skill set required to install and operate modern controlled environment production systems.

Greater levels of automation within newer, larger units naturally reduces labour requirements. The additional control, particularly within vertical farming systems, results in more prolonged or even continuous growing windows, dramatically altering the nature of the labour requirement. Within this sector, the demand for seasonal work will fall, but the persistence of older units means it will not disappear entirely. A functional seasonal worker visa will be required.

Alternative horticultural models, such as community-supported agriculture or even allotments, may partly shift the supply of labour from dedicated employees to the consumer themselves. While likely limited in scope, involvement of the consumer within the process leads to a variety of social benefits including improved health and better education around food supply.

**77%**  
of fruit and vegetable imports originate from nations with worse environmental impact scores than the UK

### CONSUMERS, FOOD AND HEALTH

While the potential for enhanced nutrition is not explicitly linked to horticulture in government policy documents, it is a realistic possibility that will contribute towards government objectives set out in the food strategy and seems to be a focus of Labour Party thinking on food policy. The food strategy aspires to see “government and industry working in partnership on a shared endeavour to promote healthier diets”.

Imports allow UK citizens to access out of season and alternative fruit and vegetables that undeniably contribute to an enhanced diet. Promotion of domestic horticultural production in conjunction with facilitating fresh, local supply will enhance that effect. In many cases, harvesting food locally permits better development of the crop, yielding improved nutrition and flavour.

### CLIMATE

Controlled environment horticulture systems are a way of at least partially insulating against climate change and its impacts, such as those experienced by Spain and Morocco. The greater the control, the greater insulation against those impacts.

The technology is also able to reduce instances of undesirable environmental practices. Previous Savills research (see *our Spotlight on agri-food sustainability*) demonstrated that 77% of fruit and vegetable imports originate from nations that have worse environmental impact scores than the UK.

“ If immediate investment in large scale structures is not possible, investors should look to secure a site with the capacity to expand facilities at a later date ”



# A new generation of glasshouses

The competitive advantage for glasshouses lies in energy solutions, modern climate control, automation and scale

Glasshouses have evolved rapidly. Newer structures have lower labour requirements, efficient heating systems and larger scale when compared to older developments. The difference in past and present design means retrofitting modern necessities to older designs, such as automated bench systems, is often difficult or ineffective.

## THE SCALE OF THE OPPORTUNITY

The inherent scale of the structure itself is crucial for modern facilities. For example, older structures will have lower eaves. Formerly, these have been sufficient to grow taller crops, such as tomato plants, without incurring unnecessary heating costs. Now and in the future, higher eaves may be required for the installation of additional climate control apparatus, such as ventilation. The additional heating requirements are offset by more energy-efficient buildings and additional yield gained from more precise environmental control.

Achieving this physical scale is rendered more difficult in the current climate due to the inflation in the prices of steel and glass. CambridgeHOK, a glasshouse build contractor, advised that glass and steel costs rose 10% to 20% in the first six months of 2022.

Only now are prices showing the early signs of stabilisation. If immediate investment in large scale structures is not possible, investors should look to secure a site with the capacity to expand facilities at a later date. *Figure 2*, right, demonstrates how the demand for produce from glasshouses is unlikely to wane.

For example, to offset imports of tomatoes, the planted area must increase by more than 150%. If tomatoes are to offset imports and contribute to achieving five-a-day to the same degree they contribute to current consumption rates (adults currently consume 3.6 portions of fruit and veg on average), that planted area must increase by 222%.

## Achieving potential

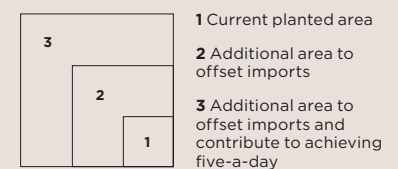


figure 2

Source Defra, HMRC, Savills Research

**820 Ha**

Average total domestic planted area for protected salad vegetables

**5x**

Increase in planted area necessary to offset imports of salad vegetables

**31%**

Proportion of build costs spent on co-siting an energy centre

## Energising glasshouses

As protected horticulture has developed, growers attribute more importance to the growing conditions. Where frost protection was once the predominant concern, large scale growers now attempt to control and optimise all elements, including temperature, humidity and carbon dioxide levels. Each element demands energy and therefore cost and so measures to mitigate this are essential.

Historic arrangements for procuring energy have been challenged by recent energy reform and the energy crisis. Partnerships between energy providers and glasshouse operators were mutually beneficial but relied on the Renewable Heat Incentive (RHI) to mitigate costs, which is no longer an option. Horticulture has not benefited from any kind of dedicated energy subsidy during the ongoing energy crisis. The government is considering incentives to encourage the “use of surplus heat and CO<sub>2</sub> from industrial processes and renewable sources of energy”, yet no further detail has been revealed.

However, a partnership approach to procuring energy still adds value to the glasshouse unit, insulating against fluctuations in prices, such as those that have been more recently observed. Reducing the volatility in this key cost helps protect margins, improving the businesses resilience

and, in turn, value. Investors may well wish to pursue this model without the aid of subsidy, but will face a higher upfront capital cost. In a Savills Research model, co-siting an energy centre with a glasshouse increased build costs by 44% over a standalone glasshouse development.

The future energy partnership approach will rely on co-location with sources of waste heat in order to secure cheaper energy and retain positive environmental credentials. This will incur some challenges. For example, the location of glasshouses will be increasingly outside of traditional horticultural areas and planning policy will need to be supportive. The pricing strategy under a co-location model is unlikely to alter from the model established under the RHI. The

horticulture business will enjoy a discount relative to grid prices and the energy provider will find a user for and earn additional income on heat energy that many sites currently vent. Developers should consider the potential strength of this position in negotiations, with the option to seek out other providers of waste heat looking to monetise waste streams.

Fossil fuel heating is arguably still an option, financially speaking. However, supermarkets are increasingly scrutinising their whole supply chain to analyse the environmental impact of their suppliers’ processes. Supermarkets will place more weight on ESG criteria in their selection of suppliers. Instances of potential purchasers deferring investment due to poor ESG credentials are already known.



### OLD BUT GOLD?

Older glasshouses can still make for attractive investment opportunities. Low eaves may prevent tall crops such as tomatoes being grown, however there are numerous other options, such as bedding plants that are in high demand. These are often seasonal, reducing the demand for year-round heat.

Older glass does not necessarily need to be replaced, providing it has been well maintained. Investors should continue with efficient maintenance, only replacing those panes that require it and keeping all glass clean in order to enhance light levels and therefore yield.

Certain sites will be more adaptable and could be upgraded, such as replacing fossil fuel heat with biomass or retrofitting screens or automation. Consider whether a site has room for expansion. The existing presence of a horticultural site will often work in favour of future planning applications.

### Costs of building a glasshouse and energy centre

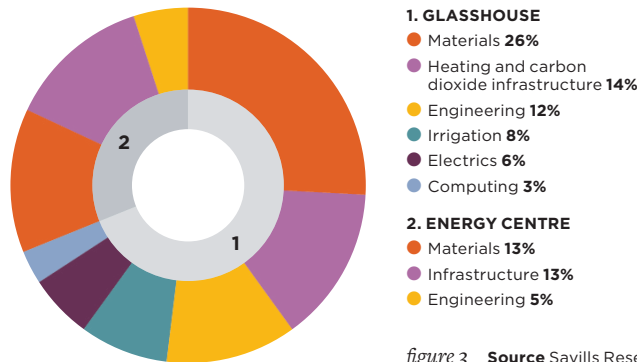


figure 3 Source Savills Research

## Attracting new investment

The horticultural business model is perhaps unfamiliar to investors more accustomed to conventional asset classes within property. Yet the sustainability benefits of controlled environment horticulture, combined with healthy yield opportunities, are difficult to overlook.

A glasshouse must embrace and promote its environmental benefits in order to secure new investment. While securing a supply of waste heat is essential to profitability, the outright consumption of energy within glasshouses is an Achilles heel of the sector if not correctly operated and promoted. Combined Heat and Power (CHP) might be

a solution; fuelled with sustainably sourced biofuels, this technology can provide both heat and electricity to the operation and contribute to the greening of the grid and investors’ portfolios.

Growing systems themselves are highly efficient, particularly as hydroponic systems are increasingly incorporated into glasshouses. Such systems ensure the correct concentrations of nutrients and minerals are delivered to crops and reduce water consumption by between 70% and 90%. Contrary to popular perception, additional lighting is only needed to promote certain crops, such as strawberries or tomatoes,

strawberries or tomatoes, where lighting can extend the growing season and therefore better cater for domestic demand. Where needed, LED systems reduce electricity and cooling demands due to their higher efficiency.

Environmental performance is not the only barrier to investment though. Up to now, the potential covenant strength of lease agreements with glasshouse operators has proven to be a barrier to investors. As glasshouses tend towards larger scale, these barriers are expected to diminish and leaseback or ground rent agreements could emerge, further fuelling the growth of the industry.

**£3,000**

Cost per square metre for a high-tech, premium vertical farm

**3.1%**

Average UK contribution to global capital investment in ag tech

**£2.85m**

Savings over five years for a 10,000 square metre unit located in a freeport

# Can vertical farms compete?

We look at four key areas to maximise margins and ensure market opportunities

While the UK makes up 3.1% of the average global investment in ag tech, investment per capita lags far behind international competitors. Nations such as Israel and Singapore face unique challenges that demand efficiency. Even so the UK is behind its nearest neighbours Ireland (26% less per capita) and France (37% less per capita). That is not to say such comparatively low levels of investment are detrimental to development. The UK finds itself on a par with the Netherlands, widely acknowledged as one of the most advanced agricultural systems in existence. The differences between the UK and Netherlands remain stark and so the question arises: how can the UK better invest in ag tech?

Vertical farming is one area where the UK is demonstrating progress, both in terms of production and innovation. Intelligent Growth Solutions in Scotland and Jones Food Company, based in Scunthorpe, are considered world leaders in the sector. Yet this is occurring against a wider backdrop of struggles and difficulties in the industry. InFarm, Europe's biggest vertical farming company recently laid off 500 workers. Agricool, a French enterprise that had raised €30 million in funding, went bankrupt in April 2022.

Vertical farming is simply not cheap. A premium vertical farm can cost as much as 750% more than a basic glasshouse. While glasshouses cost in the region of £400 to £1,000 per square metre, a vertical farm is likely to cost a minimum of £2,000 per square metre or £3,000 per square metre for a high-tech, closely controlled system. The smallest (5,000 square metres) entry level vertical farm will therefore cost a minimum of £10 million. With such expense, keen attention must be paid to maximising

the cost effectiveness of the installation and its market opportunity. Here are four key areas to focus on when establishing a vertical farming business.

## 1 SITE

There is a misconception that vertical farms could be built in highly urbanised areas and sell directly to consumers. This may be possible in select cases, however the scale and infrastructure necessitated by controlled environment horticulture is better suited to out-of-town areas, particularly those with enhanced logistical connections and reduced land costs.

One such location could be freeports. As well as being close to existing logistics networks, businesses located in freeports would enjoy certain benefits such as paying 0% NICs on the salaries of new hires for up to three years, 100% business rates relief on their premises from the date of occupation for five years and full SDLT relief until September 2026. Savills Research calculates that cost savings could amount to £2.85 million for a 10,000 square metre unit over five years. This calculation excludes plant and machinery capital expenditure allowance, meaning actual savings could be greater.

## 2 BUILDING

Investors may see warehouses as the ideal space to establish their vertical farm. Unfortunately, vertical farms are considered as a comparatively weak tenant alongside a booming logistics sector that is continuously demanding bigger and better space. To compensate for this perceived risk, landlords may expect a higher deposit or rent than the local

baseline. In such an event, it may be more financially prudent for a vertical farm to buy its own vacant site and develop bespoke facilities from the ground up. If demand from logistics weakens, vertical farms may be more easily able to enter into rental agreements, however this seems unlikely in the near term.

## 3 ENERGY

The energy profile of a vertical farm is quite different to a glasshouse. The presence of lighting, even efficient LED systems, generates heat that must be removed rather than augmented. In addition to this need for cooling and lighting, automation, hydroponics and other systems demand large quantities of electricity. Vertical farms should therefore look to partner with renewable energy providers, arranging a power purchase agreement that achieves a discount for the farm and premium for the energy supplier.

## 4 CROPS

Vertical farms are designed to exert highly controlled conditions. While this comes with an energy cost, it does expand the potential range of crops that may be grown and when they can be grown. This therefore allows conventional, out of season crops to be grown and sold at a premium and at a faster rate, allowing multiple harvests in a shorter space of time. However, the precise control permits the growth of more specialist and often higher value crops. Anything from medicinal grade cannabis to saffron, the world's most expensive spice, can be grown in a vertical farm.

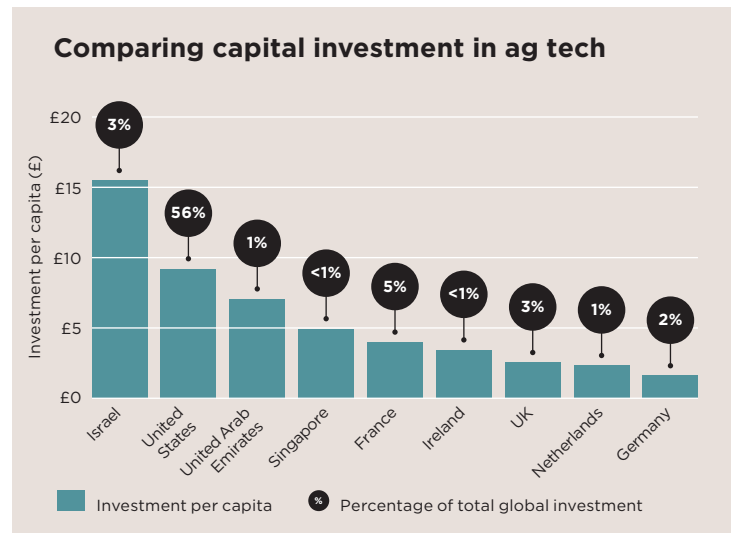


figure 4

Source Pitchbook, Savills Research

🍷 Allotments and small scale field horticulture deliver the yields in social capital; namely education and health 🍷

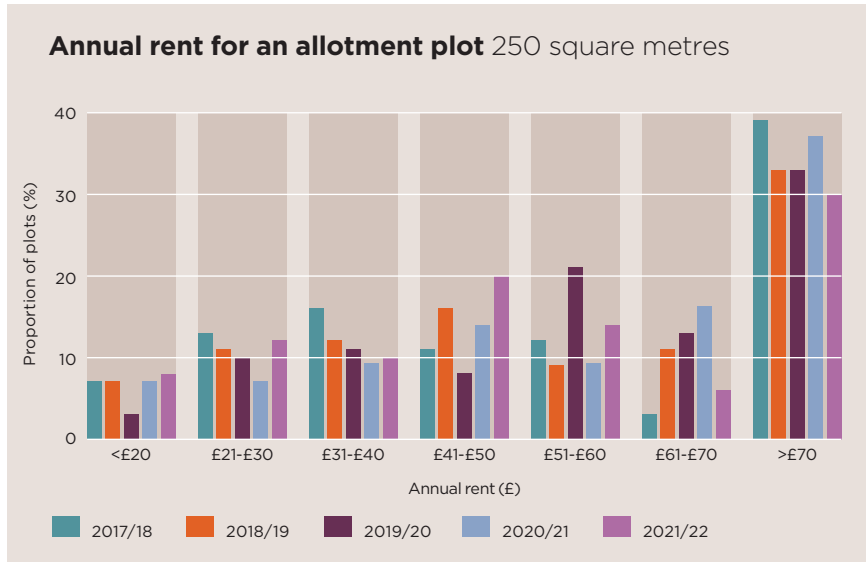


figure 5

Source APSE

## Low tech and small scale

The future of horticulture is not necessarily high tech and high cost. While controlled environment horticulture’s dedication to efficiency produces obvious benefits in food production, input costs and sustainability, allotments and small scale field horticulture deliver the yields in social capital; namely education and health.

Allotments can also offer benefits to the landowners providing them, both economic and beyond. Some landowners may shy away from the idea of allotments due to the perception of complex management and permanence. In doing so, they neglect the opportunity to engage with the local community. Any management challenge can be handled through modification of the offering; whether allotments are let individually or to an association, as large plots or small.

### THE VALUE OF ALLOTMENTS

Data from the Association for Public Service Excellence (APSE) suggests the annual rent charged by local authorities for an allotment plot can vary from less than £20 to more than £70 per year.

In 2021-22, more than 50% charged over £50 per year. Allotments are not always a profitable endeavour, however a Savills survey managed within the Rural and Projects business revealed the majority of landowners are committed to continuing to offer plots to the local community.

The overwhelming reason for this (50% of responses) was recognition by the landowner of the social and community benefit that often

accompanies the offering of allotments. Other reasons to retain allotment sites included them being a core part of the estate or a diversification of the property portfolio.

The nature of the plots offered within a given site varies significantly, something that is likely to be determined by the size and shape of the plot, the nature of local demand and the nature of the party managing the site. Around 50% of landowners interacted with individual plot holders, while a little less than a third (29%) leased the site to an association that then managed the individual plots. The remainder engaged with a mixture of these two approaches.

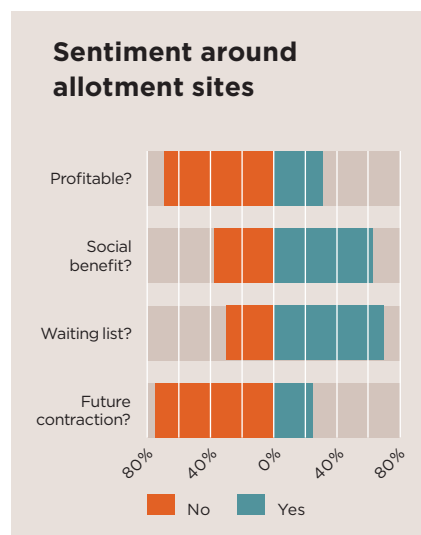


figure 6

Source Savills Research

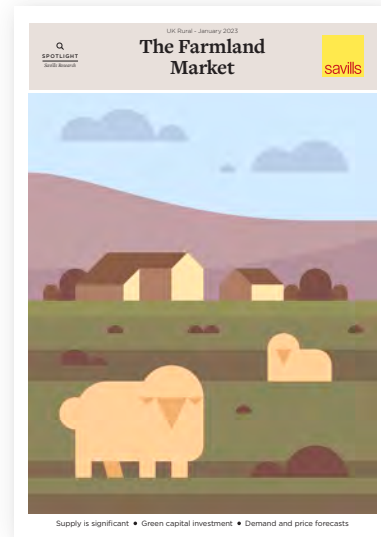
## OFFERING ALLOTMENTS

When deciding to offer allotments, establish whether there is local demand for allotments and whether a suitable plot of land is available (one with defined access roads and suitable topography for example). Determine the appetite for direct management; this may yield greater returns, but will it be worth the time invested? Better equipped sites are likely to have a higher rental value; public research from 2022 suggests that 81% of plots offer mains water but only 24% offer a lock up store and 34% offer composting facilities.

In many cases, the economic case for offering allotments is weak. Leasing land to an association yields low returns. Plots can be individually managed in house, however the income rarely compensates for the time required. Only at scale and in urban areas with high demand can sufficient rent be charged to make the enterprise financially viable. Landowners know this but continue to offer allotments; the value of allotments is not found on the balance sheet.

Allotments are a clear and obvious way for landowners to engage with their local community, particularly if directly managed. The opportunity to communicate with the community and build relationships can form a core part of an estate’s social strategy.

**81%** of plots offer mains water but only 24% offer a lock up store and 34% offer composting facilities, according to public research from 2022



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### Andrew Teanby

Associate Director, Rural Research  
+44 (0) 7835 445 458  
ateanby@savills.com

### Joe Lloyd

Associate, Rural Research  
+44 (0) 7790 824 970  
joe.lloyd@savills.com

### Antony Oliphant

Director, Rural Professional Services  
+44 (0) 7971 798 813  
aoliphant@savills.com

### Alex Bragg

Director, Food and Farming  
+44 (0) 7807 999 845  
abragg@savills.com

### Amanda Blythe-Smith

Director, Leisure and Trading  
+44 (0) 7968 550 424  
absmith@savills.com

### Ian Simpson

Director, Leisure and Trading  
+44 (0) 7967 555 478  
isimpson@savills.com